



CRM of Ukraine Database Supplements

Mineral target:	Shevchenkivske deposit
Commodity:	Lithium

Version: 17 April 2024

Project	101075609 — GSEU — HORIZON-CL5-2021-D3-02
Supplement Data	
Supplement number:	MO.400035
Dissemination level:	Public
Supplement type:	Description
Work package:	WP2: Critical Raw Materials, the International Centre of Excellence and United Nations Framework Classification (CRM-ICE-UNFC)
Lead WP/ Supplement beneficiary:	[EGS]

Supplement status	
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Location: The Shevchenkivske lithium ore deposit is located on the territory of the Volnovaskiy district of the Donetsk region, on the eastern outskirts of the Shevchenko village. At a distance of 1 km to the south, the S-050409 highway passes, 1 km to the west – S-050419. The distance to the military demarcation line with Russia is 60 km.

Research: The deposit was discovered in 1982 during deep geological mapping. In 1983-1986, prospecting works were carried out within the area of development of rare metal pegmatites at the Novomoskovska GRE. Based on the results of the work, the main ore-controlling factors of rare metal mineralization were established, the zonation of the pegmatite field was revealed, and the distribution area of rare metal pegmatites was outlined.

As a result of the works performed by the State Committee of the USSR, Protocol No. 10525 of October 28, 1988, reserves of lithium ores of the Shevchenkivske deposit, which were calculated within the geological boundaries of pegmatite veins and reserves of microcline (feldspar), were approved. In addition, by this protocol reserves were estimated for tantalum oxide, niobium oxide, beryllium oxide, as well as quartz – 4,863.6 thousand tons and mica - 527.2 thousand tons with an average content of 25% and 2.6%, respectively. In 2017, the DKZ of Ukraine tested the previously explored reserves of lithium ores and lithium oxide by protocol dated November 2, 2017 No. 4152-DSK. Protocol No. 4152-DSK dated November 2, 2017 is an addition to Protocol No. 10525 of the DKZ of the USSR dated October 28, 1988.

Site area: 40.72 ha.

Geological characteristics: From a geological and structural point of view, the Shevchenkivske deposit of lithium ores is located within the northeastern border of the Western Azov block of the Ukrainian Shield, the junction zone of the Shevchenkivska graben monocline with the Fedorivska brachysyncline. The Shevchenkivska graben-monocline can be traced in the submeridional direction for 15 km, with a width of 0.5-2.5 km.

The Shevchenkivska graben-monocline is composed of gneisses and schists of the Ternovatska formation, which is divided into aluminous, carbonate, and schists batches. The metamorphic rocks of are framed by archaean granites and migmatites. Rare metal pegmatites are confined to the schist batch, the thickness of which is 700 m. The width of the pegmatite field is 260-300 m, the length is up to 1 km, and pegmatite bodies are traced to a depth of 600 m. The thickness of the weathering crust is up to 35 m. The ore minerals over there are replaced by clay products that do not contain lithium.

The detected pegmatite veins are compactly located, have a steep dip, a northern extension, a complex zonal structure, with sharp fluctuations in thickness. They have seven structural and mineralogical zones. Mineralization is associated with albite, microcline, and petalite-spodumene zones. The main ore minerals are spodumene and petalite; accompanying - lithium mica and lithium phosphates, niobium, tantalum and beryllium minerals, which are present in the form of accessory impurities. The content of lithium oxide is 0.3-4%. Lithium is the main ore component of pegmatites and is associated with two of its own minerals - spodumene and less commonly petalite.

In addition to the main component - lithium, there is an accumulation of other rare elements at the deposit. These include rubidium, cesium, tantalum, niobium, beryllium, and tin. Rock-forming minerals and feldspars are also raw materials for the ceramic and glass industry.

Considering the insignificant content of accompanying components in the wallrock and ore zones of pegmatites, their relatively uniform distribution, separate ore bodies of accompanying components were not outlined. The maximum possible range of products that can be obtained from ores of the deposit at the next stages of the geological study of the deposit is recommended.

The deposit is covered everywhere by formations of Mesozoic-Cenozoic age with a thickness of 70-120 m.

Six pegmatite bodies of a single vein system with a steady western dip at angles of 55-88° have been established within the deposit. Lithium mineralization is confined to three zones that occupy the central parts of veins: albite-spodumene; microcline-spodumene; petalite-spodumene. The spodumene variety of ores is widespread in all ore-bearing pegmatite bodies and accounts for 90% of the total lithium ore balance.

On all selected natural varieties of ores of the Shevchenkivske deposit, at the stages of prospecting and preliminary exploration, technological studies were carried out using various beneficiation methods.

In the IMR (Simferopol), research was conducted on the spodumene flotation method, as well as radiometric and heavy-medium enrichment schemes. According to the results of the research, the combined gravity-flotation scheme with the production of spodumene concentrate containing about 5% of lithium oxide (recovery of 82.2-91.1%) and microcline concentrate, the recovery of which was 10.5-18%, was recognized as the most rational. The content of lithium oxide in most samples exceeds the average for the deposit.

The laboratory technological studies on the sulfuric acid scheme were performed. Extraction of lithium into solution comprised of 94.5% of the lithium content in the ore. Consumption of sulfuric acid ($d=1.83 \text{ g/cm}^3$) was 18% of the weight of the material or 17.5% of the weight of the ore. Sinter output was 119% of the weight of the load; content of lithium oxide in it 1.94%; free sulfuric acid - 4%. The degree of conversion of lithium into an acid-soluble form is 94% of the total metal content.

At the same time, there is a lack of quantitative assessment of the distribution of spodumene and the gangue part of pegmatites (quartz, albite microcline, muscovite), which complicates the determination of the representativeness of technological samples and the calculation of enrichment indicators in relation to their application to the calculation of reserves. Significant changes in the yield of spodumene concentrate (20-29%) and microcline (10.5-18%), even according to the same technological schemes, indicate a high natural variability in the ratio of these minerals. Mineralogical and technological mapping was not carried out.

Technological tests were not carried out in the case of processing of ores by weight. In the process of technological research, the possibility of obtaining a tantalum and niobium product was not considered (a mica product with a tantalum content of up to 100 g/t was isolated by electromagnetic separation); obtaining mica and quartz components; tests of the non-ore part of the pegmatites have not been carried out and the range, quality and quantity of products that can be obtained are uncertain. There is no assessment of the compliance of the received products with the requirements of the standards.

In accordance with the hydrogeological zoning of the territory of Ukraine, the deposit area is located in the extreme northeastern part of the hydrogeological region of the Ukrainian Shield. On the area of the site, within which preliminary exploration was carried out, underground water is spread in Neogene, Paleogene, Cretaceous sediments, in the fractured zone of Precambrian crystalline rocks and their weathering crust. Groundwater, which is distributed in the rocks of the sedimentary cover, has a close hydraulic relationship.

Water inflows to mining operations will be formed at the expense of Miocene-Eocene and Cretaceous aquifers, as well as underground waters of fractured zones of crystalline rocks. According to the estimation, the pre-calculated expected water inflow into the mine shaft will be 323 m³/hour, into the mine workings for the final period of working out the deposit - 456 m³/hour. When certain deep-lying fractured zones are exposed by mining, short-term inflows of up to 200 m³/hour can be obtained from them.

Groundwater, which is distributed in the area of the Shevchenkivske deposit, does not meet the requirements of water quality standards, which can be used for the purposes of economic and drinking water supply and land irrigation and can only be used for production and technical water supply of the plant.

The mining and geological conditions of the deposit's operation - the steep dip of the ore bodies (65-85°), the relatively large depth of their occurrence (up to 500 m) and the thickness of the overlying rocks (up to 120 m) determine the underground method of working out the deposit.

The deposit is relatively small (the length of the ore field is 1,100 m, the width is 220 m) and it can be developed by a single mine. The total volume of mining products can be 358.3-375.7 thousand m³.

The Shevchenkivske lithium deposit belongs to the group of deposits of a very complex geological structure (group 3) in accordance with the Classification of Mineral Reserves and Resources of the State Mineral Resources Fund.

The technical and economic assessment of lithium ore reserves indicates the readiness of the deposit for further industrial development.

Information about mineral resources and reserves is confidential.

Degree of development: not being developed.